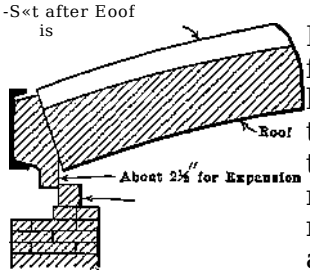
Regardless of whether the fuel is used cold or preheated it must bo brought into contact with the preheated air so that the flame formed will permit the sintering of the bottom, and the heads of the furnace must be designed to obtain this result.

One of the reasons why blue water gas and blast-furnace gas have not been considered on their heating possibilities is that they burn with a non-luminous flame, it being considered that to obtain high temperatures in the open-hearth and reverberatory furnace a flame with a so-called high radiating effect is necessary. By this is meant a luminous flame. Ifc is well known that the transmission of heat by radiation varies as the difference between the fourth powers of the temperatures of the radiating and recipient surfaces and a coefficient varying from unity for the ideal black body to a very small fraction of unity for a polished surface. Conduction varies with the temperature difference. Convection depends upon the temperature head or difference in temperature and the flow of the fluid.

In the early designs of Siemens furnaces the roof was depressed from each end to the center, as shown in Fig. 147. It was supposed that this type of roof enhanced the heating effect by forcing the flame into contact with the bath and assisted in the sintering of the bottom. This type of roof had a short life, as it had a

tendency to burn out, and it was frequently damaged when charging the furnace. Its worst defect was that it choked the furnace. Later designers were obsessed by the radiant-heat idea and this resulted in the forms of roof shown in Figs. 148 and 149.



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It was soon found, however, that this type of roof resulted in an increased fuel consumption, and the straight roof (Fig. 150) is now used. Fig. 151 shows a form of skewback designed to prevent the wall expansion from interfering with the roof. Twelve-inch roofs are widely used and many American furnaces employ the Orth

FIG. I51.-Skewback Construe- roof which permits the use of a repair

fa[n]n[to]?ird[ed]att°op[Pernlltblock Whe∗ the] intermediate shapes burn out. It is possible that a roof with cooling ribs spaced closer together than in the Orth roof would be more satisfactory.